



**SBC-TP-76450**  
**Common Systems Equipment Interconnection**  
**Standards for the**  
**SBC Local Exchange companies**

**Abstract**

**Presented in this document are the Common Systems Equipment Interconnection Standards for equipment placement**

## **1.8 Adherence to SBC Standard Suppliers**

Within the Common Systems Checklist, standard corporate providers of the product are listed as applicable. Selections of this product are performed through SBC Services Inc. NP&E on behalf of the entire SBC Enterprise. Each approved provider shall be used using SBC Local Exchange companies approved PIDs, distributors and pricing.

## **1.9 Reasons for Reissue**

Requirement 7.3, Vendor Documentation, from the previous issue has been expanded to include all of Section 7 with 13 sub-requirements. Other requirements from Section 7, Issue 7 have been moved to Section 8, Issue 8. The Checklist in Appendix B is revised to reflect these changes.

Note: Supporting documentation must be sent to SBC even for "yes" responses to requirement 7.13.

# **2 DC Power Interconnection Standards**

## **2.1 GENERAL**

### **2.1.1 Nominal -48v DC**

Nominal -48v DC is always the first choice for power delivery to any Network Element (NE). Generally, manufacturers can comply to this requirement by providing their equipment internally with various inverters and converters to meet this condition. However, within the network power architecture, various other voltages may be available in limited supply, but must be validated on a case-by-case basis for NE deployment considerations. The design criterion of the DC power is based on a normal operating voltage of approximately -50v to -56v DC, with nominal rating of -48v DC and low voltages of -42.6v DC measured at the termination point of the network element.

AC powered equipment will only be considered for approval in the SBC network when the inverter is embedded as part of the total equipment package.

### **2.1.2 Redundant Power Feeds**

Redundant power feeders are required for all equipment serving network elements<sup>1</sup>. The term network element refers to all switching, transport, data, operator services equipment, and any adjuncts for those elements.

Redundant power feeder information must be provided in the supplier's response documentation to be in compliance with this item.

---

<sup>1</sup> If the network element being served is truly redundant, it shall be utilizing an isolation technology similar to the Oring Diode for example. The maximum List 2 current supported at the BDFB cannot exceed 50% of the supply fuse rating regardless of the size. This will insure uninterrupted power to either the A or B side in the event of a power loss of either power feeds.

### **2.1.3 Battery Return Conductor**

Each redundant power feeder shall have its own battery return conductor. This design concept shall also carry through directly to each piece of equipment. For equipment with a portion of battery return current flowing to the equipment frame, the current path between the battery return and the equipment frame shall be rated at least 140% of L1 current drain (refer to Table 310.16 at 90°C of NEC).

Battery return and current path information must be provided in the supplier's response documentation to be in compliance with this item.

### **2.1.4 Architecture Integration**

To integrate into the embedded DC distribution architecture, the optimal List 2 DC drain per load should not exceed 48 amps. However, new style BDFBs can accommodate 56 amps per load. Technology Engineers should validate the load of DC amp capacity if the product requirements will exceed 48 amps DC (at List 2). DC distribution through the BDFB with up to 150 amp fuse positions may be available on a limited basis and can accommodate up to a 120A load, but additional construction costs to build out this larger design may be required.

## **2.2 POWER TERMINATIONS AT THE NETWORK ELEMENT**

This section describes the various acceptable DC power connectors and connections that are approved for use within SBC. See Table 2-1 for a classification of acceptable power connections based on cable termination.

### **2.2.1 Location of Power Terminations**

Power terminations found on network elements should terminate at the rear of the panel. Any exceptions to this will be dealt with on a case-by-case basis.

## **2.3 CONNECTORS**

Connectors used to attach the product to external power cabling shall conform to the following requirements:

### **2.3.1 16 AWG Stranded Power Cable and Larger**

For applications where the size of wire supplying or distributing power to/from the equipment is 16 AWG stranded power cable or larger, SBC shall use connectors that are pressure crimped on the power cable creating a ring type termination.

### **2.3.2 8 AWG**

Power input terminations that will accept # 8 AWG connector terminations shall use dual threaded post (stud) termination able to accept the appropriate two-hole crimp connection. The two post termination may be either 5/8" or 1/2" on centers.

Equipment surface terminations shall accept crimp connections that meet the following specifications:

- o UL486A Wire Connectors and Soldering Lugs for Use with Copper
- o UL467 Grounding and Bonding Equipment Conductors
- o UL 486C Splicing Wire Connectors
- o SAE-AS25036 (Insulated Copper Ring Crimped Terminal - Dimensions)
- o SAE-AS7928 (Copper Ring Crimped Terminal - Specifications)

Equipment submitted for approval should provide a UL listed (power) termination strip designed and designated as "field wireable" to insure product compliance with the UL listing of the product. This termination or barrier strip should be able to accommodate a ring lug connectors that comply with the UL, CSA and Mil Spec listings.

### 2.3.3 18 AWG Power Cable and Smaller

For applications where the size of wire supplying power to the equipment is 18 AWG power cable or smaller, mechanical connectors may be used.

- o The connectors shall be listed by a Nationally Recognized Test Laboratory for its intended use.
- o The connector shall be tested to assure long-term tightness and reliability. The following tests are acceptable for this requirement; IEC 60068-2-6, Basic Environmental Test Procedures, Part 2: Test Fc and Guidance: Vibration (sinusoidal); EIA Specifications 364-27B (Mechanical Shock Test Procedure for Electrical Connectors), 364-28D (Vibration Test Procedure for Electrical Connectors and Sockets), Telcordia GR-63-CORE and Telcordia GR-1089-CORE. Other vibration test procedures demonstrating long-term reliability will be considered for evaluation.
- o The product supplier shall provide documentation of routine maintenance (if any) associated with the supplied connector.

Table 2 – 1

Size conductor	Acceptable termination	Associated Listings
22 AWG – 18 AWG	Mechanical; American Standard UNC threads (Class 2 fit)	Listed by NRTL, IEC 60068-2-6, EIA SPEC 364-27B, 364-28D
16 AWG – 10 AWG	One or Two hole crimp connection. American Standard UNC threads (Class 2 fit)	UL467, UL486A, UL486C, SAE-AS25036, SAE-AS7928
8 AWG – 1AWG 1/0-4/0 250MCM – 750MCM	Two hole crimp connection. American Standard UNC threads (Class 2 fit)	UL467, UL486A, UL486C, SAE-AS25036, SAE-AS7928

## **2.4 Visual Power Alarms and Status Indicator**

The NE equipment shall provide visual power alarm and status indications by indicator devices mounted directly on the equipment. The equipment shall also be capable of transmitting alarm signals to an office alarm circuit and to sending circuits for remote surveillance using dry loop relay contacts or other means. Power alarm and status reporting information must be provided in the supplier's response documentation to be in compliance with this item.

If an alarm indicator pilot fuse is present in the power circuit, it should operate when the power fuse fails.

## **2.5 Fusing of Capacitors**

Equipment incorporating the use of power distribution apparatus which uses capacitors shall be fused to protect the power distribution bus from a shorted capacitor. Fuse and protection information must be provided in the supplier's response documentation to be in compliance with this item. The equipment manufacturer shall provide a label indicating equipment capacitors must be pre-charged prior to power up the equipment.

## **2.6 POWER DISTRIBUTION DELIVERY**

All power distribution products must meet the requirements listed in Section 1 of this document.

SBC approved Power Distribution Units (PDU) shall be used to power transport and data equipment. Power is distributed to the NE from Battery Distribution Fuse Bays (BDFB) or an arrangement utilizing a Secondary Power Distribution Unit (SPDU). The SPDU is smaller than a BDFB in physical size and capacity. Direct feed from the BDFB will be considered on a case by case basis when required. NE will not be directly fed from Power Board Distribution. Contact the SBC Common Systems Power Technical Staff when requesting direct BDFB feed.

PDUs that are independent of the network element but included as part of the total package must meet the requirements listed in this section; must be approved for use, and should be identified by an associated SBC PID (Product ID) number assigned by the SBC Power Technical Staff

All approved PDUs shall be equipped with at least one of these forms of overprotection devices, (1) GMT Fuses, (2) Telpower® Fuses, (3) DC Rated Circuit Breakers. (note: circuit breakers in PDUs shall only be fed by circuit breakers). The recommended form of DC power distribution is GMT fuses, Telpower® fuses or Circuit Breakers, in that order. The size of the DC requirement will serve as the primary qualifier, but fuses are the preferred method of over-current protection.

- GMT Fuses – Generally sized to accommodate 0.18 – 15<sup>2</sup> amp requirements. List 2 demand should not exceed 12 amps to use this product.

<sup>2</sup> SBC LOCAL EXCHANGE companies has approved one GMT fuse panel that is designed to accept 20 amp GMT fuses, if chosen, the List 2 demand should not exceed 16 amps.

- Telpower® Fuses – Exclusively produced by Cooper-Bussmann, these fuses are available in sizes from 3 amps to 600 amps, packaged in Blue to signify DC only. Telpower® fuses are also available in various styles for different needs. Some of the styles commonly seen are TPA, TPL, TPS and TPH. All Telpower® fuses should be sized at no greater than 80% of their faceplate rating as well, but not to exceed the value of the of the List 2 load.

Circuit Breakers - Only thermal magnetic and magnetic type DC circuit breakers are acceptable. Further, SBC does not recommend DC circuit breakers greater than 224 amps. Circuit breakers should adhere to all applicable UL and ANSI standards. DC Circuit breakers that are labeled 100% are full load rated and may be sized at the same capacity as the List 2 drain (The List 2 drain is defined as the peak current required to operate equipment load under worst case operating conditions at 42.6v DC )

**NOTE:** Due to the circuit protection strategy deployment found in SBC LOCAL EXCHANGE companies, the use of circuit breakers placed in the power architecture should be avoided when a fuse provides the next step of protection (generally found at the BDFB). It is recommended that circuit breakers be protected by circuit breakers, fuses with fuses or fuses protected by circuit breakers. The use of circuit breakers placed in the embedded power distribution units found in network elements should be avoided. The preferred method of circuit protection at this level is fuses.

**2.6.1 All fuses and circuit breakers shall meet Quality Level III as defined by Telcordia SR-332.**

**2.7 Individually Mounted PDU**

Even though not recommended as a choice by SBC, some Network Elements designed by various manufacturers require specific PDUs that include unique characteristics needed to serve their specific network device. These "special PDUs" must meet all the same design criteria identified in this document as well as the SBC-TP-76200 NEBS publication. If accepted, this "special PDU" would be listed as part of the Network Element approval, purely as an integral part of the package and its approval is exclusive to the associated network element. Furthermore, this "special PDU" should be reviewed by the Common Systems Technical Staff to insure its integrity.

**2.8 NE Integrated Power Distribution**

Defined as; power distribution that is integrated within the framework of the network element (e.g. #5 ESS PDF frame). Generally speaking, NEs requiring more that 200 amps of DC power need this type of power distribution. The NEs are commonly found in large multiple interrelated-bays.

These type devices are considered equipment specific and should meet the requirements as listed in Section 1 of this document as well as the SBC-TP-76200 NEBS publication. Additionally, SBC recommends the use of fuses in lieu of breakers in these applications.

## **2.9 Direct BDFB Power Delivery**

As an exception, there are some new network elements that employ high DC current demands that when collectively configured in a packaged bay arrangement may exceed available fuse position capacities found at the BDFB. In a method to utilize the existing SBC - DC distribution architecture, these individual network elements may be independently and directly fused at the BDFB via an SPDUI. In these instances, direct feeds to the BDFB may be considered appropriate. However, the individual network element shall include an on/off /power cut off to locally disconnect the power from the bay components. In applications where a bay mounted SPDUI is desired, SBC has approved products designed to serve in that capacity and still allow for independently fused services.

## **3 Synchronization/Timing Standards**

The Building Integrated Timing Supply (BITS) concepts are the SBC LOCAL EXCHANGE Company's method of providing Phase and Frequency synchronization. The BITS plan details that each office have one Primary Reference Source (PRS)/(Stratum-1) traceable office master clock called the BITS. Under the BITS concept, each/every timing capable Network Element (NE) in the office should derive its timing from that single source within the office. A timing capable Network Element is defined as any digital equipment piece that is capable of conforming to the BITS concept by accepting timing from an external source. A Network Element is still timing capable even if it is not currently configured or equipped to accept external timing via SBC approved wire-wrap connections; as long as the option exists to allow it to be so equipped.

### **3.1 Termination of timing leads**

All critical network element timing leads shall terminate only on the office master BITS/TSG shelf or one of its DIRECT expansion shelves.

### **3.2 Clock output lead cabling**

Composite clock output leads to CCS7 and remote BITS/TSG equipment shall be cabled through flexible interduct and have diverse routing.

An External Clock Wire Wrap (ECWW) adapter kit or equivalency are the preferred method of clock timing leads terminations instead of DB or RJ type connectors (GR-1244, R3-10). Wire-wrap pins sync connections are the SBC standard, NO dB or RJ type connectors allowed, no exceptions.